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ABSTRACT

This study examines the impact of one important task characteristic for the process by which groups solve problems. The principal comparison is between a generative problem and a choice task, and whether or not the differences between these types of tasks affect the group's methods for arriving at a decision. Two types of analysis are conducted of the process by which 43 groups solve a hypothetical personnel selection problem. The results show a disparity between the manifest and implicit choice processes, with the latter determining the decisions. Implications are discussed for the relationship between manifest and implicit processes. (Author/KA)

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An Analysis of the Process of Making Choices in Groups

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Hoffman's (1965) review of the group problem-solving literature concluded that one of the barriers to progress in this field has been the lack of understanding of the parameters of the different tasks used by different investigators. He suggested that identifying the nature of such parameters and their impact on the problem-solving process would be a worthwhile enterprise. Since then work by Hackman (1975) and by James Davis (1973) has demonstrated the substantial importance of task variations for the nature of the group's process.

The present study examines the import of one important task characteristic for the process by which groups solve problems. The principal comparison we will draw is between a generative problem and a choice task. A generative problem is one for which the group must invent possible solutions before choosing one of them. Most problems in organizations are of this type. A choice task is one in which a single solution must be chosen from a given, but exhaustive, set of mutually exclusive alternatives. Decisions regarding the hiring or promotion of personnel, the purchase of property or equipment, or the guilt of a suspect are examples of choice tasks often performed by groups.

One principal difference between the generative and choice types of problems would appear to arise from the more limited set of options available to a group for resolving disagreements on the choice task. The members may not generate a new alternative, since the set is exhaustive, nor may they compromise or create a new solution by combining the best parts of two or more options. These methods were available to, and often used by, groups

to solve the generative problem. The question we ask in the present study is whether and in what ways the differences between these types of tasks affect the group's methods for arriving at a decision.

We shall attempt to answer this question in two ways. Our first concern is whether the valence model of problem solving (Hoffman, 1961) would apply to the choice task as it had to the generative task (Hoffman & Maier, 1964, 1967). The model posits that groups adopt a solution by generating positive valence for it sufficient to exceed both an adoption threshold and the valence for all other solutions. Therefore, we shall apply valence analysis to compare the problem-solving processes on the generative and choice tasks. That comparison will be followed by a more detailed analysis of the unique features of the choice process.

A second approach to this question derives from an extension to the group of the work of Bruner (1957) and Newell and Simon (1972) on individual decision making. They have shown that individuals reduce the "cognitive complexity" of choice tasks by initially discarding unacceptable alternatives and then selecting from among the reduced set of possible solutions. If groups also follow this approach, a two-stage process should be identifiable for the choice task, which was not apparent in the problem-solving process on the generative task. These are different stages, of course, than the Bales-Strodtbeck phases of orientation, evaluation and control, since one might assume that the choice task is what those authors would call a truncated problem.

Subjects and Procedure

Forty-five groups of 3-, 4-, and 5-persons, recruited from introductory psychology classes, solved the Assembly Problem. Forty-three groups of 3-, 4-, and 5-persons solved the Personnel Selection Task during their class

sessions in an MBA program. Each group was observed by two coders trained in valence analysis. Transcripts were made of 28 of the latter 43 groups, from which valence was coded and verbal comments taken. Valence in all other groups was coded while the groups solved the problem.

Tasks

The Assembly Problem (the generative task) describes a case of industrial underproduction and asks the group to suggest the best remedy. The typical group mentions about twelve possible solutions. The Personnel Selection Task (choice task) presents five mythical resumes of candidates for a hypothetical job and asks the group to select the best one.

Valence Coding System

Described briefly, the valence system involves the tabulation of all comments identifiable with a particular solution to the problem. Each comment is coded as favorable (+) or unfavorable (-) to the solution. The valence index for any solution is the algebraic sum of positive and negative comments for that solution. The valence index has shown strong correlations with the adoption of, and satisfaction with, solutions to the generative task (Hoffman & Maier, 1964, 1967), as will be seen in the tables comparing those results to those for the choice task.

Results

The first question to be answered is whether the valence model is as descriptive of the choice task as of the generative task. Three types of regularities consistent with the model have been demonstrated for the generative task between the valence index and the adoption of solutions by groups. The first is that on the generative task the solution with the

highest valence index was adopted in the vast majority (80.0%) of groups. Similarly, on the choice task 89.5% of the groups adopted the solution with the highest valence index.

The second regularity, shown in Table 1, is between the valence values achieved by each solution and the percent of times it was adopted by a group. The left-hand half of the table shows that on the generative task 81.8% of the 33 solutions whose valence exceed 40 were adopted as the principal solution, while successively smaller percentages were adopted at lower valence levels (50.5% from 30 to 39; 26.2% from 15 to 29, and almost none below that). An almost identical pattern was revealed by the choice task, as seen in the right-hand half of the table. None of the differences between the two problems is statistically significant.

The third regularity on the generative task was the early predictability of the to-be-adopted solution. The solution which first accumulated a valence index of 15 was adopted in 68.9% of the groups. The comparable figure for the choice task was 67.4%.

All three valence-adoption relationships suggest that the problem-solving process for both tasks was consistent with the valence model. The average group tended to adopt that solution to which it gave early support--sufficient to create a surplus of 15 positive statements over negative statements--and to continue to argue in favor of that solution so it retained its valence advantage over other contenders until it was adopted. The greater the net frequency of positive over negative statements made about a solution, the more likely it was to be adopted by the group.

Although the process of adopting the final solution seems similar for the two types of tasks, further analysis of the data for the choice task reveals a more complicated, if complementary, picture. Examination of the

bottom row of Table 1 shows that while only 1 (0.2%) of the 537 possible solutions suggested for the generative task accumulated a negative valence of less than -10, 66 (30.7%) of the solutions to the choice task were rejected so vigorously. The statistical significance of this difference is unquestionable, but its implications for the character of the group problem-solving process was unclear. It appeared that groups easily discarded most solutions to the generative task with a few negative comments, while on the choice task much more effort was required to reject a candidate.

To understand this difference in the treatment of unacceptable solutions we examined the process further by hypothesizing the existence of a rejection threshold, analogous to the adoption threshold of 15. We therefore searched for a valence value which, once achieved by a solution, precluded its adoption by the group. Unfortunately the question of whether a solution possibility has been rejected is not answered as easily as whether it has been adopted. For the latter case the group submits its choice. All solutions not chosen are, in one sense, ultimately rejected. Yet, in certain cases. groups considered two or three candidates in those cases made their choice by majority vote. The unchosen candidates in those cases must be considered quite differently from those which the group has discarded with many unfavorable comments.

The following criteria were established to identify a threshold for actively rejected candidates. After a solution has accumulated sufficient negative valence to drop below such a threshold: (1) that solution would never be adopted (this is certainly a minimal criterion); (2) subsequent discussion of that solution would either be minimal or would continue to accumulate negative valence for the solution. Using these criteria it was possible to identify a rejection threshold of about -8 for the choice task.

Fifty-three solutions dropped below -8 in 24 of the 28 groups. In 4 groups no solution accumulated a valence index of less than -8. Only 1 of the 53 candidates reaching -8 was ever adopted. In terms of the second criterion, 88% of those solutions reaching -8 either continued to move in the negative direction or else were not further discussed. Thus, these statistics point to -8 as the value for the rejection threshold.

Having identified this value, we asked the following questions of the data. Did active rejections of candidates occur uniformly throughout the group decision process of were they concentrated in certain parts of the discussion? Fifty-five percent of the 53 actively rejected solutions had dropped below the threshold of -8 by the first third of the discussion, 70% by the midpoint, and 93% by the end of the second third. Thus, the active rejection of candidates was concentrated in the earliest part of the discussion. Although discussion of some of these candidates often continued for many more acts, such discussion usually added more negative valence.

Was there a clear separation of the active rejection of candidates and the adoption of others, as implied by the decision-tree hypothesis? Or were some candidates being adopted while others were being rejected? One way of answering these questions is to determine how often the ultimately adopted solution passed the adoption threshold (+15) before all rejected candidates had dropped below the rejection threshold (-8). Twenty of the 53 active rejections occurred after the ultimately adopted candidate has passed the adoption threshold. Put another way, in 12 (50%) of the 24 groups at least one candidate was pushed below the rejection threshold even after another had received enough support to be ultimately adopted. Thus, the valence analysis shows that in many groups adoption of certain candidates

was occurring at the same time as the rejection of others, casting doubt on the clear separation of the two-phase hypothesis.

Decision-Tree Hypothesis

Examination of the decision-tree (or "phase") hypothesis for the choice task was conducted on the 28 groups for which transcripts of the discussions were available. A two-stage process was reliably identified[a] in 24 of them: (1) a rejection phase, usually ended by a comment like "We've discarded two of them." or "We only have these two left." and (2) an adoption phase, in which the group selected the best solution from the remainder. The end of the rejection phase varied considerably from group to group. Seven (29%) of the groups spent three-fourths of their meeting on the rejection phase, while four (17%) groups spent only the first third or less in that phase. The only seeming necessary condition for a change in phase seemed to be at least a cursory review of all possible candidates, although four of the 28 groups adopted a candidate without ever formally concluding the rejection phase.

The announcement which signaled the end of the rejection phase strongly focused the rest of the group discussion. Table 2 shows that few comments were made in the adoption phase about solutions the group had discarded in the rejection phase, even though they may have been discussed at length during that phase. Although, on average, solutions which were discarded by the group had had 42 comments made about them during the rejection phase (versus 33 for those retained), only about 9 comments were made subsequently, while the retained candidates each received 50 comments. A more vivid picture

of the effect of the announced rejection of these 64 candidates is seen in the fact that 31 (48%) of them were not discussed or received only one comment in the adoption phase. Furthermore, almost needless to say, none of them was ever adopted by their group.

Thus, the announcement of the end of the rejection phase served two functions. (1) It identified those candidates which were out of the running (or those who were still in) and (2) it instructed the group to focus on selecting among the remaining candidates and prohibited discussion of the discards. The announcement never indicated which of the remaining candidates was to be chosen or even preferred. At the verbal level one receives the impression that the retained candidates will be considered equally in the adoption phase.

We then determined the relationship between the manifest, two-stage process and the underlying valence structure. Table 3 shows that the valence index of solutions at the end of the rejection phase foretold their fate. Of the 34 solutions which had fallen below a valence of -8, only one was retained for the adoption phase. At the other extreme, all but one of the 29 solutions whose valence exceeded 15, the adoption threshold, by that point were retained for further discussion. Although solutions with positive valence less than 15 were retained more often than were those with some negative valence, their fates were less predictable.

The next question we asked was whether the two or three solutions retained for further discussion were equally probable candidates for adoption or did their valence status before the adoption phase predict the final outcome? In the 24 groups examined, 18 of the solutions with the highest valence at the end of the rejection phase were adopted ($p < .01$).

However, in all but two of these 24 groups, the adopted solution accumulated the highest valence during the adoption phase as well.

Discussion and Conclusions

The process of choosing from a given set of alternatives seems both similar to and different from the process of first having to invent solutions to a problem. The similarity lies principally in the adoption mechanism. Maier's contention (1963) that groups are "solution-minded" receives confirmation in the consistency with which groups seem to "choose" their adopted solution early in the discussion by supporting it beyond the adoption threshold. Despite the introduction of other alternatives to the generative task and the emphasis on rejecting unacceptable alternatives on the choice task, the first solution past threshold continues to have the highest valence and is finally adopted.

Two principal differences should be noted, however. The most important point arises from the discrepancy between the announced process and the latent process uncovered by valence analysis. Most groups seemed to reject candidates first and then to consider the remainder for adoption. Valence analysis showed that groups often "chose" their adopted candidate before they had completed the rejection phase. During the adoption phase the group may have merely confirmed that choice, rather than really evaluating the assets and liabilities of the supposedly contending alternatives. Nothing in the transcripts suggested that the group recognized this function of the adoption phase, so valence analysis reveals an implicit process that may prevent groups from a proper evaluation of the available evidence.

The second point is that the phases proposed by Bales and Strodtbeck may have been too imprecisely measured in their system. By attending to the

actual process of evaluating and adopting solutions, we can determine the significant times in the discussion when each group has made an adoption or rejection decision implicitly. When groups make their decisions explicit, there would appear to be a shift in that process of at-present unknown dimensions.

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Table 1

Valence Index and Adoption of Solutions

Valence Index	Generational Problem (N = 45 Groups) Percent of Solutions: Adopted Principal	Adopted Subordinate	Not Adopted	No. of Solutions	Choice Task (N = 43 Groups) Percent of Solutions: Adopted	Not Adopted	No. of Solutions
≥ 40	81.8%	6.1	12.1	33	80.0%	20.0	35
30 to 39	50.0%	16.7	33.3	12	58.3%	41.7	12
15 to 29	26.2%	35.7	38.1	42	36.4%	63.6	22
1 to 14	0.3%	2.9	96.8	312	0.0%	100.0	28
-9 to 0	0.0%	0.0	100.0	137	0.0%	100.0	52
≤ -10	0.0%	0.0	100.0	1	0.0%	100.0	66
				537			215

Table 2

Number of Comments Made About Solutions

During Rejection and Adoption Phases

Solutions:	Rejection Phase	Adoption Phase
Discarded	42.1	9.1
Retained	32.9	50.1

Table 3

Valence of Solutions at End of Rejection

Phase and Group Action

(28 Groups)

Valence of Solution	Solution was: Discarded	Retained
15 or more	1	28
0 to 14	13	22
-1 to -7	17	5
-8 or less	33	1